REMARKS

Applicant respectfully requests reconsideration of the rejection of claims 1, 2, 5-7, 15, 16, 18, and 28-30. Claims 8, 17 and 19 were objected to as depending from rejected claims. Claims 3, 4, 9-14 and 20-27 are indicated in the Office action (paragraph 4a) to be withdrawn from consideration but this ignores the Office action dated Dec. 17, 2004, and the response thereto. In the prior Office action of Dec. 17, 2004 claims 3, 4 and 9-14 were merely objected to, and applicant made extensive amendments in response. Claims 20-27 were still withdrawn. Now, however, without considering the immediately prior action but referring to correspondence in 2002, the current Office action returns to a prior restriction requirement. Reconsideration is respectfully requested because after the RCE was filed, the former Examiner obviously dropped the restriction requirement as to all but claims 20-27. Furthermore, these claims, which all depend in some way from claim 1, are properly within the same subject matter that has been searched and acted upon.

Editorial changes have been made in a few of the claims (claims 2, 5, and 28) for better syntax only – no new matter is involved. The expression "hand tight plane" in claims 2 and 15 has been changed to "hand tight position" for reasons given below.

The Office action of June 29, 2005 withdrew the prior indication of allowability of a substantial number of claims, and rejected them on Patent No. 3,572,777 to Blose et al. This rejection is respectfully traversed, and the reasons advanced for the applicability of Blose et al are submitted to be erroneous and without foundation.

The present application is directed to, and claims, only a sucker rod configuration. The Office action maintains, para. 6 on p. 3, that Blose et al discloses "a connection for sucker rods", citing col. 2, lines 5-12 therein. Blose et al neither suggest a sucker rod

connection nor can the cited language be construed as having any applicability to sucker rods.

Power driving linkages for petroleum pumping have their own status in the art, and in API (American Petroleum Institute) specifications, which specify particular and detailed standards and requirements. All of this has been set out in detail in the present specification referencing two technical articles of record, the book "Modern Sucker Rod Pumping" by G. Takacs and the article "Finite Element Analysis of Sucker Rod Couplings with Guidelines for Improving Fatigue Life" by Hoffman, published by Sandia Corp. The background is also set out in some of the prior art previously of record such as Carlson 4,205,926, Newman 6,212,963 e.g. and McCullough 1,851,714.

In a sucker rod system, an activating force has to be transmitted along and within a tubing string to activate a pump, whether of the reciprocating (horse head) type or of the progressive cavity or rotary type. All that Blose et al state at col. 2, lines 5-12 is that the pipe may be "tubing, casing or drill pipe such as used in gas and oil wells". Why Blose et al refer to "drill pipe" in this context is not understood, because pipe used in drilling has no relation (and Blose et al shows none) to the sealing improvements which are the objectives of the Blose et al patent. Moreover, this one reference to "drill pipe" certainly does not relate to sucker rods in any way. The Office action is therefore incorrect in saying that col. 2, lines 5-11 of Blose et al disclose a configuration that could be used in sucker rods or in any analogous application.

The Blose et al teaching is actually concerned with sealing tubing or casing against leakage through engaging threaded or contacting surfaces, between engaging surfaces at the nose ends of hollow tubing sections, and between contacting pin ends and peripheral shoulders at the ends of tubing threads. Whether used in hollow tubing or

casing, the Blose et al configuration is to be held stationary once implanted downhole at the drill site. Then oil or gas can be pumped, or transported under pressure, up vertically to the surface within the hollow interior of the string, hopefully with no leakage at the connections.

Another reason the Blose et al reference is applicable only to hollow tubing or casing, and not to sucker rods, is that in Blose et al the threads of the interconnection are tapered, while in sucker rods the threads are straight (as seen in the Figures in the present application.) In practice, with oil field goods having tapered threads, as male and female members are tightened, they come to a well defined stop when radial interference is encountered. This is commonly referred to as the 'hand tight plane". However, the expression should not have been used in claims 2 or 15, because the straight threads of the sucker rod do not reach a point of interference as they are threaded together. Instead the stop point is defined by axial interference of the face end of one pin with the other, or by axial engagement of a shoulder on the pin end against the end of the coupling, or both. Thus the change to hand tight position is appropriate, correct and involves no new matter. In the specification as filed, the expressions predominantly used were "hand tight connection" [paragraph 005]., "hand tight position" [paragraph 007] and "hand tight engagement position" [paragraph 013].

In contrast, applicant's specification and the articles originally cited, namely Takacs and Hoffman (Sandia article) discuss wholly unrelated problems and a unique solution that counteracts fatigue failures arising from continuous cycling and large load variations. The fatigue failures ensue following initialization of microcracks or relative displacements in and between the elements of a sucker rod string, during continuous cycling. No solution for this problem can be found in the hollow tubular, static anti-

sealing structure proposed by Blose et al.

Therefore, where applicant's specification and claims refer to sucker rod, they rely upon the established context of a longitudinal string of load bearing elements with solid pin ends threaded into coupler sleeves. Further, the connection is characterized by end-to-end engagement of the pin ends in a manner that is capable of withstanding not only the significant mass loads on the string, but the additional alternating loads imposed by the stresses introduced by pumping. Accordingly, the sucker rod pin ends are said to have flat end faces for load bearing purposes, and it is inappropriate to contend that the nose ends of the Blose et al configuration have "flat end faces". This error is amplified by the fact that the nose ends 16 of the hollow pins in Blose et al are undercut at an angle to match the internal annular shoulder 19a in Fig. 1 of Blose et al. The Office action purports to find an equivalent between the torque washer set out in the present claims and the Teflon pressure seal element 17 shown in Figs. 2 and 3 of Blose et al, which is basically an O-ring type seal which is made of an elastomer that is more firm than rubber. The term "torque washer" clearly connotes a flat fixed element disposed between the opposing flat faces of the pin ends, and functioning to distribute areal forces that are exerted parallel to the longitudinal axis of the sucker rod string. A steel tubing or casing structure, such as the hollow tubing or casing of Blose et al cannot in any way function under the varying loads that exist during sucker rod operation, in which the resultant stresses can vary from 15,000 to 80,000 psi. If an interior ring of Teflon or another elastomer were to bear the weight of the metal or resist such cyclic forces it would be crushed to atomization. In no way could the Blose et al pin end forces be transmitted through a Teflon O-ring type seal sufficient to prestress axially the center of the coupling, as taught and claimed by applicant.

Other distinctions are pointed out in relation to specific claims, noted below. The one relationship of Blose et al to the present invention that merits some brief consideration is the fact that the shoulders 14 on the pin ends are intended to have a relation to the length of the collar 11, so that when the connection of Blose et al is fully engaged, the shoulders 14 provide limit stops for the pins 10 because of engagement with the ends 15 of the female member 11. In the present application, a length relationship is used between the collar longitudinal dimension and the length of the pin from the external shoulder to the flat end at the nose of the pin. This length relationship is used in conjunction with other factors to establish needed prestressing and balance between both the pin ends and the collar, as well as the operative relation between the end faces of the pin ends, whether or not a flat torque washer is interposed.

In relation to their length relationships, Blose et al merely rely on "machining tolerances" col. 1, line 24, which will allow either shoulder to abut first, providing "an axial deformation of 0.010" maximum, which deformation may take place on either member or be distributed between the point members, before the secondary shoulder abuts (col. 1, lines 26-30). This usage of dimensional relationships is solely for the purpose of providing another form of seal, namely the end-to-end sealing of the faces of the female coupling member 11 relative to the external annular shoulder 14 of the male member. The sealing is enhanced by the undercut of the shoulder 14 (claim 2, lines 39-40). The primary seal, however, of the Blose et al structure is provided by the "so-called phonograph finish" on the complementary surfaces 12 and 13 (col. 2, lines 29-37). A third seal is provided by the undercut angles on the end 16 of the male member and the internal annular shoulder 17a of the female member (col. 2, lines 65-67). These shoulders are undercut preferably at the same angle "as indicated in connection with the

surfaces 14 and 15" (col. 2, lines 65-75). This is referred to (col. 2, lines 65 in Blose et al) as a "secondary seal..."

In essence, therefore, the hollow tubing or casing structure shown by Blose et al is for transporting gas or oil internally, and not for providing a power-transferring string that can transfer motion to a downhole pump and undergo the cyclic force variations that give rise to the fatigue factors discussed in the Takacs and Hoffman (Sandia) articles that are of record. The contention that the end-to-end contact between the male and female members constitutes the equivalent of applicant's claim structure is respectfully but strenuously traversed. Not only is Blose et al totally lacking in any suggestion of load transmission in compression and tension, but there is no teaching whatsoever that would enable one to apply the Blose et al teachings to a sucker rod system. The small cross-sectional areas provided by the abutting end rings in Blose et al are incapable of transmitting any meaningful forces along the longitudinal axis, and would be subject to plastic deformation. Also, these small surfaces are angled, at angles specified to be in the 5-10% range, with the express intention of further aiding the sealing characteristics. A sucker rod system, on the other hand has no sealing problem but has a fatigue failure problem that arises from the gradual accretion of microcracks in the sucker rod configuration.

It is respectfully pointed out that all claims have been rejected regardless of how clearly the geometry of the elements is spelled out therein, so that it is considered that the rejection of the independent claims as fully met is based on gratuitous and erroneous assumptions as to the relevance of the teachings of Blose et al. Since the Office action discusses the claims in some detail, if erroneously, this response likewise is longer than it normally would be.

The rejection of claims 1, 2, 5-7, 16, 16, 18 and 28-30 under 35USC§102b is accompanied, on pages 3-8 of the Office action by a detailed recitation of the claims, accompanied by assertions that are in no way supported by Blose et al. As to claim 1 for example, Blose et al is said to disclose a "connection for sucker rods" at col. 2, lines 5-12, but this is not correct because Blose et al is only concerned with hollow tubing for transporting petroleum products, not for an internal structure, specifically a sucker rod, for pumping. The Office action thus then continues, with respect to claim 1, to assert that Blose et al disclose a pair of "sucker rods 10" which is not supported or shown in any way, and that each has "a pin end 16 with a flat transverse end face", another statement which is not correct. The pin ends of Blose et al are neither "flat" nor "transverse".

The analysis of claim 1 is correct in saying that the coupler or female member of Blose et al is of "known length" and that it has two internal female threaded sections, but the contention that the sucker rods include "coupler and engagement members 14 spaced apart from the end faces of the sucker rods..." is incorrect, because there is neither any such statement, nor end faces, nor sucker rods. The further contention in the final subparagraph on p. 3 as to claim 1 that the sucker rods are tensioned in length relative to the coupler length to provide prestressing compressional loading forces" when there is selected penetration of the pin ends of Blose et al past engagement with the coupler end contains a number of misconceptions. First, the length dimensions of the coupler are selected such that the pin ends deform axially (col. 1, lines 26-32) in Blose et al, which, along with the undercut end surfaces, provides a secondary seal (col. 3 lines 43-44) in Blose et al. Nothing is said in Blose et al about "pre-selected penetrations in the coupler past engagement of the coupler and engagement members with the coupler ends..." This assertion in the Office action completely ignores the language in claim 1 as to the

provision of "compressional engagement between opposing pin ends when the male threaded sections are matingly inserted" to a pre-selected penetration in the coupler. As pointed out in the present specification, there may be tolerance variations in the element, and these affect the novel prestressing arrangement which is achieved by applicant's invention. Blose et al on the other hand merely accepts the dimensional variations by being indifferent to the degree of engagement and whether it arises at one end or the other as the connection is made (col. 6, lines 26-29).

The reference on page 3 to the interposed element 17 in Figs. 2 and 3 of Blose et al which calls this gasket 17 a "torque washer" is submitted to be wholly erroneous. The interposed washer between the load bearing faces that is connoted by the term torque washer and set out in more detail in claim 5 is fundamentally unlike this gasket 17 of Blose et al. The gasket 17 is "preferably made of a halogenated hydrocarbon ester such as fluorinated hydrocarbon ester under the trademark Teflon..." which is an utterly inappropriate material for sucker rods. This is an indisputably pliant material, under the load forces involved, and could be used by Blose et al because they were concerned with preventing the gasket from "being squeezed out during makeup" and therefore affect the seal (col. 3, lines 16-18). The plastic O-type ring 17 of Blose et al disposed between spaced-apart nose ends 16 of the male members 10 cannot suggest the possible use of sucker rod pin ends with end faces which are in compressional engagement between opposing pin ends when the male threaded sections are matingly inserted to a pre-selected penetration in the coupler. Claim1 is therefore resubmitted without modification.

Claim 2 is treated in the final paragraph on p. 3 of the Office action, where it is asserted that Blose et al teaches "a chosen displacement beyond insertion...to the hand

tight" plane or more precisely position, followed by further assertions as to the pin sections being prestressed in compression and co-extensive lengths of the coupler being prestressed in tension, with the mating threads locking under prestress. Blose et al say nothing about insertion beyond the "hand tight" plane or "position", as in claim 2 as amended, nor do they mention anything about compression and opposing tension in different sections. In the petroleum industry and as noted in the present specification, the "hand tight" position is well understood and referenced. It provides a physical reference for threaded engagement, and consequently is not a method step on which reliance is being placed.

Claim 2 is therefore submitted to be allowable, along with parent claim 1, and also for its recitations of additional compression, tension and prestress relationships contained therein.

Claim 5 was discussed in the first paragraph of p. 4 of the Office action. Without undue repetition, applicant traverses the contention that the ring seal 17 of Blose et al is a "torque washer", that it has a selected axial dimension with flat transverse sides and that it is disposed centrally in the coupler between the pin end faces and engaged on each side by the flat end faces of the pin ends. Furthermore, Blose et al merely substitutes the ring seal 17 of Fig. 2 for the central interior shoulder 17a of Fig. 1, and suggests no change "to account for the presence of the torque washer" to provide "prestressing compressional forces on the pin ends..." Claim 5 which is dependent from claim 1 is therefore resubmitted in its slightly amended form for the patentable distinctions it contains.

Claim 6, was rejected in the second paragraph on p. 4, and again the Teflon pressure seal ring of Blose et al was described in the Office action as a torque washer. It

was also gratuitously assumed that this element is to "prevent galling", despite the fact that Teflon is an elastomeric material not suited for load bearing so as to involve surface galling. Further, as to claim 6, the peripheral chamfers on the surface are not shown or suggested in Blose et al, wherein the central elements do not even have flat end faces which can be peripherally chamfered and which teach only the undercutting of the engaging rings along lines that are angled relative to the transverse plane.

Claim 7 was dismissed as "fully met" under 35USC§102b referring specifically to Fig. 2 of Blose et al, even though Blose et al do not show or suggest pin end faces which are flat or which have ±0.0005" flatness, or with a selected "axial dimension with less than ±0.0005" tolerance. Fig. 2 of Blose et al differs from Fig. 1 only in the use of the central Teflon pressure seal ring and does not discuss the flatness of the pin end faces or the axial dimension tolerance. Claim 7 is therefore resubmitted.

Claim 15 was discussed in the Office action in some detail, starting at the bottom of page 4 and continuing on to page 5. The discussion above of the patentability of claim 1 above is also applicable here but certain aspects of claim 15 will nonetheless be referred to in some detail to controvert the assertions made in the Office action. That is, Blose et al do not teach a "torque element of a selected axial length... having transverse end faces". Blose et al teach only the use of solid central shoulder of Fig. 1 or the Teflon O-type ring of Fig. 2. The pin ends are of tubing or casing and not of "sucker rods", they do not have "flat end faces", and the shoulders are not spaced from the end faces "to prestress" the male thread sections "in compression and associated portions of the coupler in tension...when the pin ends are engaged...to a selected displacement of the shoulders against the coupler ends past the hand tight plane...". With a wholly different

geometry and functionality expressed in terms of operative relationships, claim 15 patentably distinguishes over Blose et al.

Claim 16, dependent from claim 15, distinguishes for the same reasons and further in specifying that the threads are "in accordance with API standards" and that the "prestress conditions lock the different threaded elements together to rapid relative displacement and fatigue failure under rapid cycling and bending stresses". Nothing can be assumed, however gratuitously, to be found in Blose et al as to this characterization of a solution to the particular problems encountered in operating sucker rods.

Claim 18 is discussed on p. 6 of the Office action and even though this "connection for sucker rods used in pumping" is recited in different terminology than prior claims 1 and 15, for example, it is submitted that the prior discussions of those claims apply, are sufficient for patentability, and need not be repeated here. It is further respectfully submitted, however, that the recitation of claim 18 of the smaller cross-sectional area referred to as the "undercut pin neck" in claim 18 further characterizes the sucker rod structure, is nowhere shown or suggested by Blose et al. Thus the suggestion that it is, in the last paragraph on page 6 of the Office action, is wholly gratuitous.

Similarly, the recitations on p. 7 and p. 8 of the Office action as to independent claims 28 and 29 are treated only in cursory fashion by merely reciting the elements of the claims in general terms, without confronting or considering the distinguishing aspects of the invention. These deal with the aspects of the invention which solve the problems of the art as recited in the Takacs and Hoffman (Sandia) publications referred to in the introductory portion of the specification. The patentable distinctions of these claims have been recited in the discussion above, as to parent claims 1, 15 and 18, and need not be repeated here.

The rejection of Claim 30, dependent from claim 29, purports to find in Blose et al some teaching of makeup by either a torque or a circumferential displacement method, to establish "a prestress level..."that eliminates detrimental relative movement between the combined parts "approaching or at the microstructure level of the materials used." A reference is made to Fig. 2 of Blose et al, which however contains no basis for such a statement and claim 30 is resubmitted in its present form.

It is noted that claims 8, 17 and 19 are only objected to (para. 6 in the Office action) as depending from rejected base claims. This indication of allowability is acknowledged.

In the light of the above considerations applicant respectfully requests reconsideration of the rejection of claims 1, 2, 5-7, 15, 16, 18, and 28-30 in their present form. Applicant also requests withdrawal of the implicit restriction requirement claims 3, 4 and 9-14 and allowance of these claims as well.

Respectfully submitted

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